

# Appendix A

## S U G G E S T E D R E A D I N G

*Listed here is a selection of technical papers and Internet Web sites about optical interferometry — SIM's observing method — and stellar astrometry, SIM's principal science area. Most of the technical papers are review articles providing an overview of a particular subject, or are seminal papers in the field. Web sites are valuable sources of up-to-date information, for example, catalogues of discoveries of extrasolar planets.*

*Many of these references were drawn directly from the excellent and comprehensive compendium, *Long Baseline Stellar Interferometry*, by Peter Lawson (the first reference given below). There is no better place to start an exploration of the literature of optical interferometry from 1868 through 1997.*

### **Astrometric Science**

Lawson, P. R., 1997. *Long Baseline Stellar Interferometry*, SPIE Milestone Series, vol. MS 139.

*A compendium of reprints of many of the key papers in optical interferometry.*

*Optical Long Baseline Interferometry News*

<http://huey.jpl.nasa.gov/olbin/>

*This online newsletter is a forum for scientists, engineers, and students who share an interest in long-baseline stellar interferometry. Included are links to projects devoted to stellar interferometry, news items, and resources for further research.*

Space Interferometry Mission

<http://sim.jpl.nasa.gov>

*The SIM Project Web site, maintained by JPL, covers all aspects of SIM, including science, public outreach, instrument design, and technology challenges.*

*Space Interferometry Science Working Group (SISWG) Final Report, 1997.*

<http://www.ess.sunysb.edu/~simswg/>

*This extensive report details the SIM instrument, its history, and its extraordinary science capabilities.*

Boden, A., M. Shao, and D. Van Buren, 1998. "Astrometric Observation of

MACHO Gravitational Microlensing," *ApJ* **502**, 538.

*A discussion of the prospects for astrometric observation of MACHO gravitational microlensing events. SIM will study microlensing via astrometric, not photometric, signatures.*

Hummel, C. A., D. Mozurkewich, N. M. Elias, A. Quirrenbach, D. F. Buscher, J. T. Armstrong, K. J. Johnston, R. S. Simon, and D. J. Hutter, 1994. "Four Years of Astrometric Measurements with the Mark III Optical Interferometer," *AJ* **108**, 326.

Ma, C., E. F. Arias, T. M. Eubanks, A. L. Fey, A.-M. Gontier, C. S. Jacobs, O. J. Sovers, B. A. Archinal, and P. Charlot, 1998. "The International Celestial Reference Frame Based on VLBI Observations of Extragalactic Radio Sources," *AJ* **116**, 516.

*Documents the new International Celestial Reference Frame, adopted as the new definition of celestial coordinates by the IAU at its 23rd General Assembly.*

Mozurkewich, D., K. J. Johnston, R. S. Simon, P. F. Bowers, R. Gaume, D. J. Hutter, M. M. Colavita, M. Shao, and X. P. Pan, 1991. "Angular Diameter Measurements of Stars," *AJ* **101**, 2207.

Paczynski, B., 1996. "Gravitational Microlensing in the Local Group," *ARAA* **34**, 419.

*A comprehensive review of the observation and astrophysics of photometric microlensing. The status of searches for gravitational microlensing events of the stars in our galaxy and in other galaxies of the Local Group, the interpretation of the results, some theory, and prospects for the future are reviewed.*

Shao, M., M. M. Colavita, B. E. Hines, D. H. Staelin, D. J. Hutter, K. J. Johnston, D. Mozurkewich, R. S. Simon, J. L. Hershey, J. A. Hughes, and G. H. Kaplan, 1988. "The Mark III Stellar Interferometer," *A & A* **193**, 357.

*A description of the Mark III stellar interferometer, which operated on Mt. Wilson from 1986 to 1993.*

Shao, M., M. M. Colavita, B. E. Hines, J. L. Hershey, J. A. Hughes, D. J. Hutter, G. H. Kaplan, K. J. Johnston, D. Mozurkewich, R. S. Simon, and X. P. Pan, 1990. "Wide-Angle Astrometry with the Mark III Stellar Interferometer," *AJ* **100**, 1701.

*A description of the initial two-color, wide-angle astrometric measurements made with the Mark III interferometer.*

Sovers, O. J., J. L. Fanelow, and C. S. Jacobs, 1998. "Astrometry and Geodesy with Radio Interferometry: Experiments, Models, Results," *Reviews of Modern Physics* **70**, 1393.  
*A comprehensive review of astrometry as done with VLBI at microwave frequencies. It has detailed discussion of the models needed to achieve 100–200-microarcsecond accuracy, which represents the current state of the art.*

## Planet Searching

Bahcall, J., editor, 1991. *The Decade of Discovery in Astronomy and Astrophysics*, National Academy Press.  
*A comprehensive report on future directions in ground- and space-based astronomy by the Astronomy and Astrophysics Survey Committee, commissioned by the National Research Council.*

*ExNPS Roadmap*  
<http://origins.jpl.nasa.gov/library/exnps/ExNPS.html>  
*A roadmap for the Exploration of Neighboring Planetary Systems, summarizing the efforts of a large group of scientists and engineers. The ExNPS roadmap recommends a combination of individual ground- and space-based projects, ensuring a continuous stream of important discoveries.*

Extrasolar Planets Encyclopedia  
<http://www.usr.obspm.fr/planets/encycl.html>  
*A very comprehensive site that maintains an up-to-date catalog of extrasolar planets, a description of detection methods, and links to Web sites for the various search projects.*

NASA's Origins Program  
<http://origins.jpl.nasa.gov>  
*Covers the entire Origins Program; contains links to the individual Origins missions, including SIM.*

Boss, A. P., 1996. "Extrasolar Planets," *Physics Today* **49**, 32.

Butler, R. P., and G. W. Marcy, 1996. "A Planet Orbiting 47-Ursae-Majoris," *AJ* **464**, L153.

Marcy, G. W., and R. P. Butler, 1996. "A Planetary Companion to 70-Virginis," *AJ* **464**, L147.

Mayor, M., and D. Queloz, 1995. "A Jupiter-mass companion to a solar-type star," *Nature* **378**, 355.  
*Announcement of the first extrasolar planet discovered.*

### Optical Interferometry

Armstrong, J. T., D. J. Hutter, K. J. Johnston, and D. Mozurkewich, 1995. "Stellar Optical Interferometry in the 1990s," *Physics Today* **48**, 42.

Armstrong, J. T., et al., 1998. "The Navy Prototype Optical Interferometer," *ApJ* **496**, 550.

*A complete description of the NPOI instrument design, construction, and operation.*

Colavita, M. M., J. K. Wallace, B. E. Hines, Y. Gursel, F. Malbet, D. L. Palmer, X. P. Pan, M. Shao, J. W. Yu, A. F. Boden, P. J. Dumont, J. Gubler, C. D. Koresko, S. R. Kulkarni, B. F. Lane, D. W. Mobley, and G. T. van Belle, 1999. "The Palomar Testbed Interferometer," *ApJ* **510**, 505.

Michelson, A. A., and F. G. Pease, 1921. "Measurement of the Diameter of Alpha Orionis with the Interferometer," *ApJ* **53**, 249.

*The classic experiment with a 20-foot interferometer mounted on the Mt. Wilson 100-inch reflector.*

Reasenberg, R. D., et al., 1997. "POINTS Mission Studies: Lessons for SIM," in *Planets Beyond the Solar System and the Next Generations of Space Missions*, ASP Conference Series, D. R. Soderblom, editor, **119**, 191.

Reasenberg, R. D., editor, 1998. *Proceedings of SPIE 1998 Meeting on Astronomical Interferometry*, Kona, Hawaii, **3350**.

*A series of papers on the state of the art in ground-based and space-based instrumentation, as of March 1998.*

Shao, M., and M. M. Colavita, 1992.

"Long-Baseline Optical and Stellar Interferometry," *ARAA* **30**, 457.

*An overview of long-baseline interferometry, focusing on the Mark III interferometer, and the prospects for spaceborne instruments.*

### Interferometry Technology

Angel, R., and N. J. Woolf, 1996. "Searching for Life on Other Planets," *Scientific American* **274**, 60.

Angel, R., and N. J. Woolf, 1997. "An Imaging Nulling Interferometer to Study Extrasolar Planets," *ApJ* **475**, 373.

Gursel, Y., 1998. "Metrology for Spatial Interferometry V," in *Proceedings of SPIE Conference on Astronomical Interferometry*, Kona, Hawaii, March 23–30, 1998, R. D. Reasenberg, editor, **3350**, 571.

Laskin, R. A., 1999. "Technology Development for the Space Interferometry Mis-

sion (SIM)," Paper No. 056, *Proceedings of the IEEE Aerospace Conference*, Snowmass, Colorado, March 1999.

Levine, M., 1998. "The Interferometry Technology Program Flight Experiments: IPEX I & II," *Proceedings of SPIE Astronomical Telescopes and Instrumentation Conference*, Kona, Hawaii, March 1998.

Neat, G. W., A. Abramovici, J. W. Melody, R. J. Calvet, N. M. Nerheim, and J. F. O'Brien, 1997. "Control Technology Readiness for Spaceborne Optical Interferometer Missions," *The Space Microdynamics and Accurate Control Symposium*, Toulouse, France, May 1997.

# Appendix B

## SCIENCE WORKING GROUP

*This book is largely based on the SIM science program, developed under the guidance of the Science Working Group. The group's contributions have created the rich set of investigations that are summarized in the earlier chapters of this book. We are pleased to acknowledge their dedicated work and enthusiasm for SIM.*

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# Appendix C

## ACRONYMS AND ABBREVIATIONS

2MASS 2-Micron All-Sky Survey

### A

AIM Astrometric Interferometry Mission (became SIM)

AO Announcement of Opportunity (NASA)

arcsec arcsecond (also: as)

Astro-SPAS Shuttle-borne, German-developed reusable platform

AU astronomical unit

AXAF Advanced X-Ray Astrophysics Facility

### C

C Celsius

Caltech California Institute of Technology

CCD charge-coupled device

CHARA Center for High Angular Resolution Astronomy

CPU central processing unit

### D

DARA Deutsche Agentur für Raumfahrtangelegenheiten GmbH (German Space Agency)

Darwin Name for ESA space infrared interferometer project proposal

Dec declination

DLI dilute lens imager

DSN Deep Space Network

### E

EIISO Edison International Infrared Space Observatory (ESA)

EOS Earth Observing System

ESA European Space Agency

ExNPS Exploration of Neighboring Planetary Systems



**F**

FAME	Full-Sky Astrometric Mapping Explorer
FFT	fast Fourier transform
FK5	Fifth Fundamental Catalog
FMI	Focused Michelson Interferometer
FOR	field of regard
FSM	fast-steering mirror
FY	fiscal year

**G**

GAIA	Global Astrometric Interferometer for Astrophysics (ESA)
GC	General Catalog
GOES	Geostationary-orbiting Operational Environmental Satellite
GSC	Guide Star Catalog

**H**

Hipparcos	ESA space astrometry mission
HR	Hertzsprung–Russell (diagram)
HST	Hubble Space Telescope
Hz	hertz

**I**

ICRF	International Celestial Reference Frame
IMOS	Integrated Modeling of Optical Systems
IPEX	Interferometry Program Experiment (German Space Agency)
IR	infrared
IRSI	Infrared Space Interferometer (ESA)
ISC	Interferometry Science Center (Caltech)
ISIS	Interferometric Stellar Imaging System
I & T	integration and test

**J**

JPL	Jet Propulsion Laboratory
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**K**

kHz	kilohertz
kpc	kiloparsec

**L**

L2	Lagrangian 2
LAN	local area network
LMC	Large Magellanic Cloud

M		N	
MACHO	Massive Compact Halo Object	NASA	National Aeronautics and Space Administration
mag	magnitude	Nd:YAG	neodymium-doped, yttrium–aluminum–garnet (laser)
MAM	Microarcsecond Metrology (testbed)	NGST	Next Generation Space Telescope
MAPS	Multichannel Astrometric Photometer with Spectrograph	NPOI	Navy Prototype Optical Interferometer
μas	microarcsecond (also: μarcsec)	NRA	NASA Research Announcement
mas	milliarcsecond (also: marcsec)		
Mbps	megabits per second	O	
MHz	megahertz	OPD	optical path difference
MIPS	million instructions per second	OSI	Orbiting Stellar Interferometer
MLI	multilayered insulation	P	
mm	millimeter	pc	parsec
MMA	Millimeter Array	PMM	Precision Measuring Machine (USNO)
Mpc	megaparsec	POINTS	Precision Optical Interferometer in Space
MPI	Microprecision Interferometer (testbed)	PPN	parameterized post-Newtonian

PSF	point spread function	STB	SIM System Testbed
PTI	Palomar Testbed Interferometer	S/W	software
PZT	lead zirconate titanate	STEPS	Stellar Planetary Survey
<b>Q</b>		<b>T</b>	
QSO	quasi-stellar object	TOM	thermal optical modeling
<b>R</b>		TPF	Terrestrial Planet Finder
RA	right ascension	<b>U</b>	
RICST	Real-time Interferometer Control Software Testbed	USNO	United States Naval Observatory
<b>S</b>		<b>V</b>	
rms	root-mean-square (also: RMS)	VEM	viscoelastic material
<b>S</b>		VLA	Very Large Array
SB	surface brightness	VLBI	very long baseline interferometry
s	second	<b>W</b>	
SIM	Space Interferometry Mission	WFE	wavefront error
SIRTF	Space Infrared Telescope Facility	<b>Y</b>	
SMC	Small Magellanic Cloud	yr	year
SPAS	Shuttle Pallet System		
ST-3	Space Technology 3		